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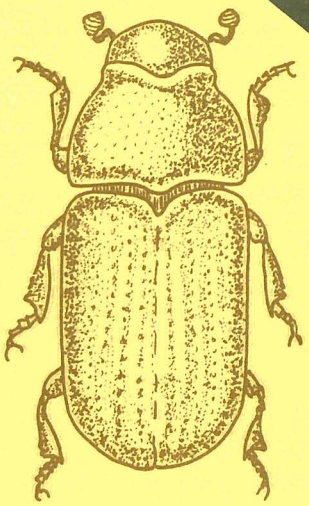

Southwestern Region

U. S. DEPARTMENT OF AGRICULTURE

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THE OCCURRENCE AND CONTROL OF THE WESTERN SPRUCE BUDWORM IN THE SOUTHWESTERN REGION

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INTRODUCTION

The western spruce budworm, Choristoneura occidentalis Freeman, has been a chronic pest of Douglas-fir and true firs in Region 3. New foliage is the preferred forage material with all age classes of host trees being attacked. The impact of the budworm on resource values in Region 3 has yet to be determined, but data from other Regions suggest that the budworm has caused reductions in growth, mortality of understory trees (both regeneration and pole-sized trees), reduced seed crops, and adversely affected aesthetic values in areas defoliated for several successive years.

The purpose of this report is to summarize records on the occurrence and control of the western spruce budworm in the Southwestern Region. Prior to 1950, records are incomplete and only general infestation trends are discussed. More complete records are available for the period from 1950 to the present.

OCCURRENCE OF OUTBREAKS

Only limited information is available on the occurrence of the budworm prior to 1950. Early reports came from the Carson National Forest, the Cibola National Forest, and the Santa Fe National Forest.

Carson National Forest.--Spruce budworm activity was first recorded in the Southwestern Region in 1922 on the Western Division of the Carson National Forest. Outbreaks persisted through 1925 and then declined. No budworm activity was reported on the Carson National Forest in 1926 and 1927. In 1928, defoliation again became noticeable, with severe defoliation being recorded throughout the Western Division of the Carson National Forest in 1929. Populations declined again until 1935 when buildups were reported in the Tierra Amarilla Division. Subsequent budworm activity decreased to a low level until 1940 when flare-ups were recorded for the first time in the Eastern Division of the Carson National Forest. Budworm activity fluctuated from 1940 to 1946, mainly on the Tres Piedras, Vallecitos (now El Rito), Rio Pueblo (now Penasco), and Taos Ranger Districts.

Cibola National Forest.--Budworm activity on the Cibola National Forest was first reported in 1941 in the Sandia Mountains. The degree of defoliation fluctuated through 1946. No budworm activity was reported on the Cibola National Forest in 1947 and 1948. In 1949, 4,800 acres were infested in the Sandia Mountains between the Capulin Picnic Area and La Madera, with an additional 1,000 acres defoliated in the Mt. Taylor area.

Santa Fe National Forest.--An outbreak of the budworm on the Pecos Ranger District, Santa Fe National Forest, was discovered in 1924. Budworm activity declined gradually in subsequent years, with little noticeable defoliation by 1930. No further budworm activity was reported on the Santa Fe National Forest until 1950.

Regional Occurrence - Post-1950.--In 1950, a total of 20,400 acres of host type was defoliated on the Cibola, the Santa Fe, and the Carson National Forests. Also, in 1950, a new infestation had begun on the North Rim of the Grand Canyon, Grand Canyon National Park. The North Rim infestation declined abruptly in 1951 due to natural causes. In 1952 and 1953, infestations were reported in the Sacramento Mountains, Lincoln National Forest; in the Sandia Mountains, at Mt. Taylor, and La Mosca Peak, Cibola National Forest; on the Alpine and Greer (now Springerville) Ranger Districts, Apache National Forest (now Apache-Sitgreaves National Forest); on the Colonias (now Tesuque) Ranger District, Santa Fe National Forest; and on the North Rim of the Grand Canyon, Grand Canyon National Park. Budworm defoliation increased throughout the Region in 1954, covering 867,106 acres in Arizona and New Mexico. This budworm activity declined by 1957. In 1958, 100,000 acres of defoliation were reported on the Kaibab National Forest.

Aerial surveys in 1959 revealed a total of 619,920 acres infested by the budworm on the Cibola National Forest, the Santa Fe National Forest, and adjacent State and private lands. By 1960, the infestation increased to 697,760 acres. Defoliation decreased from a high of 1,029,780 acres in 1961 to 450,000 acres in 1963, with 920,000 acres infested in 1962.

Budworm activity remained static from 1963 until 1968, at which time the infested acreage decreased to 83,000 acres throughout the Region (Table 1, Appendix). No activity was found in 1969 and 1970.

In 1971, 50,000 acres of host type were defoliated on the Carson National Forest. This infestation declined in 1972. The 1972 and 1973 figures were indicative of an upward trend for the Kaibab National Forest, with the Eagle Nest Entomological Unit, east of the Carson

National Forest, remaining static (Table 1, Appendix). Defoliation in 1974 was moderate on the Carson and Kaibab National Forests, and light on the Eagle Nest Entomological Unit and the Cibola and Lincoln National Forests.

ENTOMOLOGICAL UNITS

The 1954 infestation prompted a Region-wide survey to provide recommendations for control in 1955. Seven entomological units were established throughout the Region in areas historically subject to budworm activity. For the location of these units, see the Appendix, Figure 1. The entomological units established in 1954 were:

1. Pecos Entomological Unit (900,000 acres)
2. Baca Entomological Unit (700,000 acres)
3. Tierra Amarilla Entomological Unit (750,000 acres)
4. Sacramento Entomological Unit (300,000 acres)
5. Mt. Taylor Entomological Unit (10,000 acres)
6. Kaibab Entomological Unit (200,000 acres)
7. Apache Entomological Unit (75,000 acres)

An additional entomological unit, Chuska Unit (Navajo Indian Reservation), was added in 1955.

The system of entomological units was revised in 1963 for a pilot control study. New units were added, while old units were, in part, redesignated. See Appendix, Figure 2, for the location of these entomological units:

1. Cloudcroft Entomological Unit (Sacramento)
2. Glenwood Entomological Unit
3. Santa Fe East Entomological Unit (Pecos)
4. Santa Fe West Entomological Unit (Baca)
5. Chama Entomological Unit (Tierra Amarilla)
6. Taos Entomological Unit

7. Eagle Nest Entomological Unit

8. Navajo Indian Reservation Entomological Unit (Chuska)

9. North Kaibab Entomological Unit

10. Ruidoso Entomological Unit

11. Sandia Entomological Unit

CONTROL

The first control effort against the budworm in Region 3 was in 1955. Table 2 (Appendix) summarizes the number of acres controlled with DDT for each entomological unit. In 1956, an additional 6,000 acres of defoliation on the Cibola National Forest and, in 1958, 100,000 acres of defoliation on the Kaibab National Forest were sprayed with DDT in an effort to control the budworm (Appendix, Table 3).

In 1962, 444,791 acres on the Carson and the Santa Fe National Forests were sprayed with DDT (Appendix, Table 3). Additional defoliation in 1963 was discovered on 450,000 acres in New Mexico. At this time, a pilot control study was initiated to test the efficacy of dimethoate. The DDT-treated area covered 630,192 acres, with 395 acres being treated with dimethoate. Mortality on the DDT-treated area was 96.6 percent, while mortality on dimethoate-treated areas was 84 percent. Fifty-two percent mortality was recorded on the control area which received no treatment.

In 1966, 60,800 acres on the Carson National Forest were sprayed with malathion to control the budworm (this was the last control action taken against the budworm in Region 3). Average budworm mortality over the 60,800 acres was 49.9 percent.

SUMMARY

Infestations of the western spruce budworm have persisted in all areas of the Region where extensive stands of Douglas-fir and true firs occur. The budworm has been particularly active in north central New Mexico on the Santa Fe and Carson National Forests, as well as the Kaibab National Forest in Arizona.

Indications are that the Kaibab, Carson, Santa Fe, Cibola, and Lincoln National Forests will continue to be areas of chronic budworm activity.

A P P E N D I X

Table 1.--Acres infested by western spruce budworm, 1964-1973.

Year	North Kaibab	Eagle Nest Unit	Chama Unit	Glenwood Unit	Cloudcroft Unit	Taos Unit	Total
1964		250,000	100,000	40,000	90,000		480,000
1965		250,000	60,000	20,000	90,000	50,000	470,000
1966		230,000	40,000		90,000	80,000	440,000
1967		130,000			90,000	80,000	300,000
1968		3,000				80,000	83,000
1969							
1970							
1971						50,000	50,000
1972		15,000					15,000
1973	50,000	15,000					65,000

Table 2.--1955 western spruce budworm control operations; acres controlled for each entomological unit.

Unit	Acres controlled
Pecos	115,558
Jemez (Baca)	151,022
Tierra Amarilla	104,305
Sacramento	75,726
Mt. Taylor	6,827
Kaibab	0
Apache	0
Chuska	0
Total	453,438

Table 3.--Western spruce budworm control, 1950-1969.

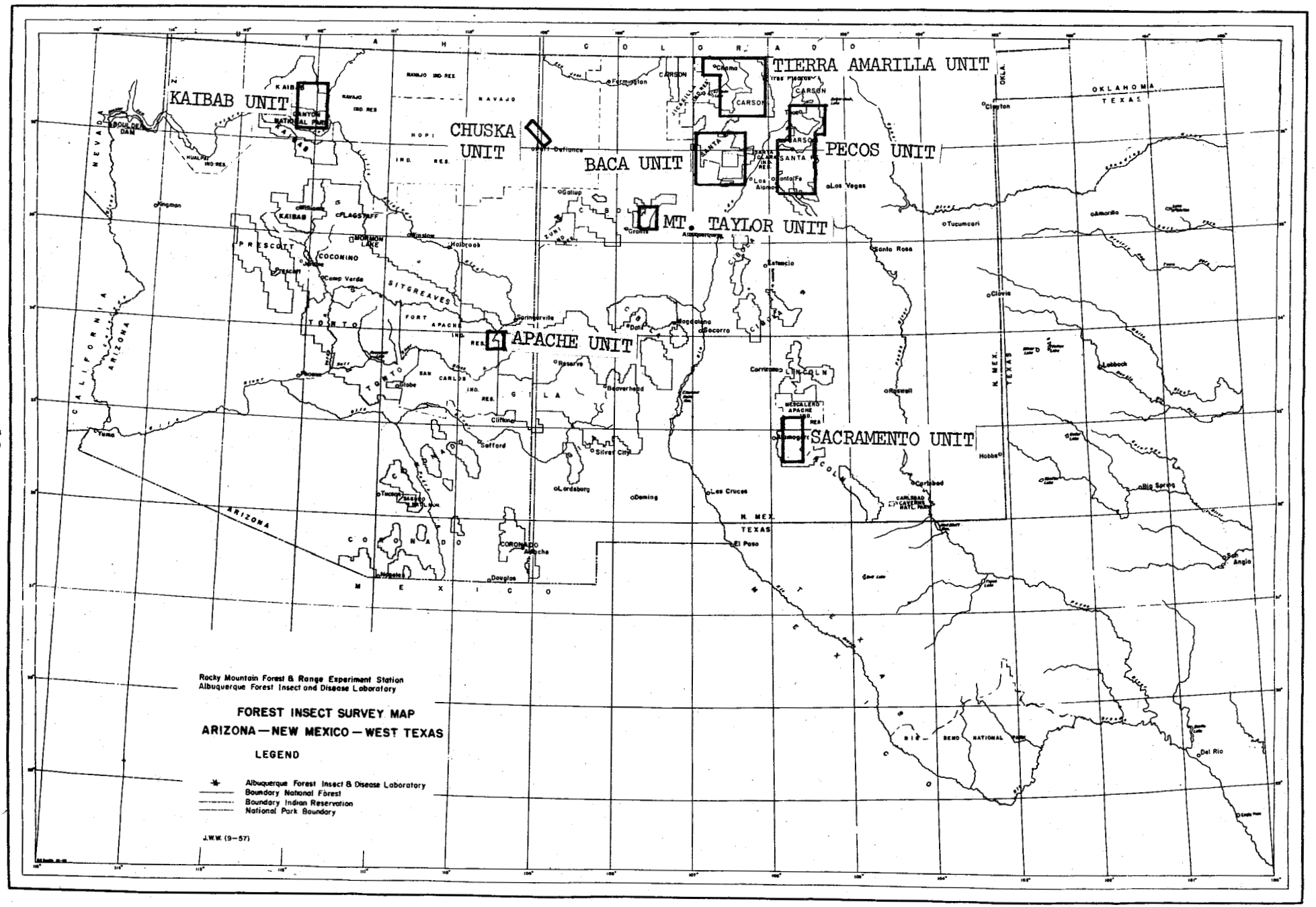
Year	Area	Acreage treated	Insecticide	Formulation	Application rate - amt. per acre	Active ingredient lb./acre
	Arizona					
1958	Kaibab NF Grand Canyon NP	100,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1963	Navajo I.R.	103,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
	New Mexico					
1950	Cibola NF Santa Fe NF Carson NF	20,400	DDT	1.0 lb./gal fuel oil	1.0 gal.	1.0
1953	Cibola NF	4,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1954	Lincoln NF	3,700	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1954	Cibola NF	2,700	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1955	Carson NF	104,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1955	Cibola NF	9,400	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1955	Lincoln NF	76,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1955	Santa Fe NF	166,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1956	Cibola NF	6,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1962	Carson NF Santa Fe NF	85,000	DDT	½ lb./gal. fuel oil	1.0 gal.	0.50

Table 3.--Western spruce budworm control, 1950-1969 (cont'd.).

Year	Area	Acreage treated	Insecticide	Formulation	Application rate - amt. per acre	Active ingredient lb./acre
1962	Carson NF Santa Fe NF	359,791	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1963	Navajo I.R.	61,000	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1963	Carson NF	165	Dimethoate	1/8 lb./gal. water	1.0 gal.	0.125
1963	Carson NF	230	Dimethoate	$\frac{1}{4}$ lb./gal. water	1.0 gal.	0.25
1963	Carson NF Santa Fe NF	10,332	DDT	$\frac{1}{2}$ lb./gal. fuel oil	1.0 gal.	0.50
1963	Carson NF Santa Fe NF	455,860	DDT	1.0 lb./gal. fuel oil	1.0 gal.	1.0
1966	Carson NF	60,800	Malathion	9.74 lb./gal.	12 fl.oz. (1/10 gal.)	1.0

FIGURE

Western spruce budworm entomological units established in 1954.



FIGUI

Western spruce budworm entomologic__ units established after 1963